A Framework for Demonstrator Development in Cyber-Physical Systems

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Objective

To build demonstrators in a structured way, so that innovations like predictive maintenance can be tested, validated, and used in practice.

Why This Work?

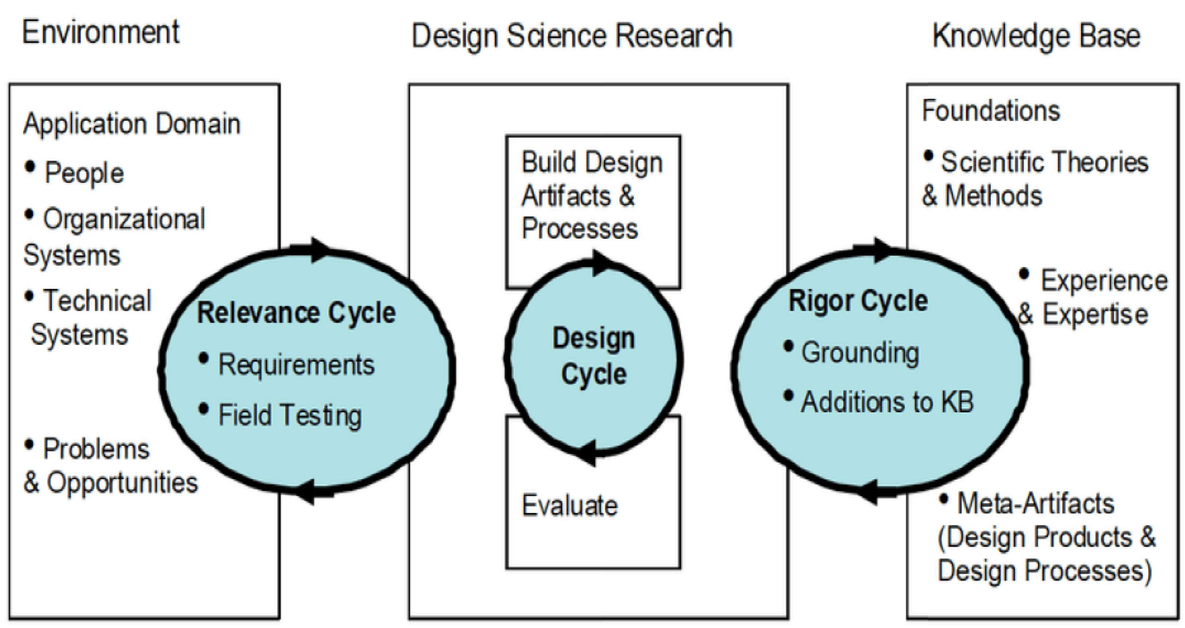
- Downtime = expensive ($1.2T/year globally).
- Predictive maintenance helps — but needs testing.
- Demonstrators help bridge lab and industry.
- But: no clear method to build them.

Our Idea: A Structured Framework

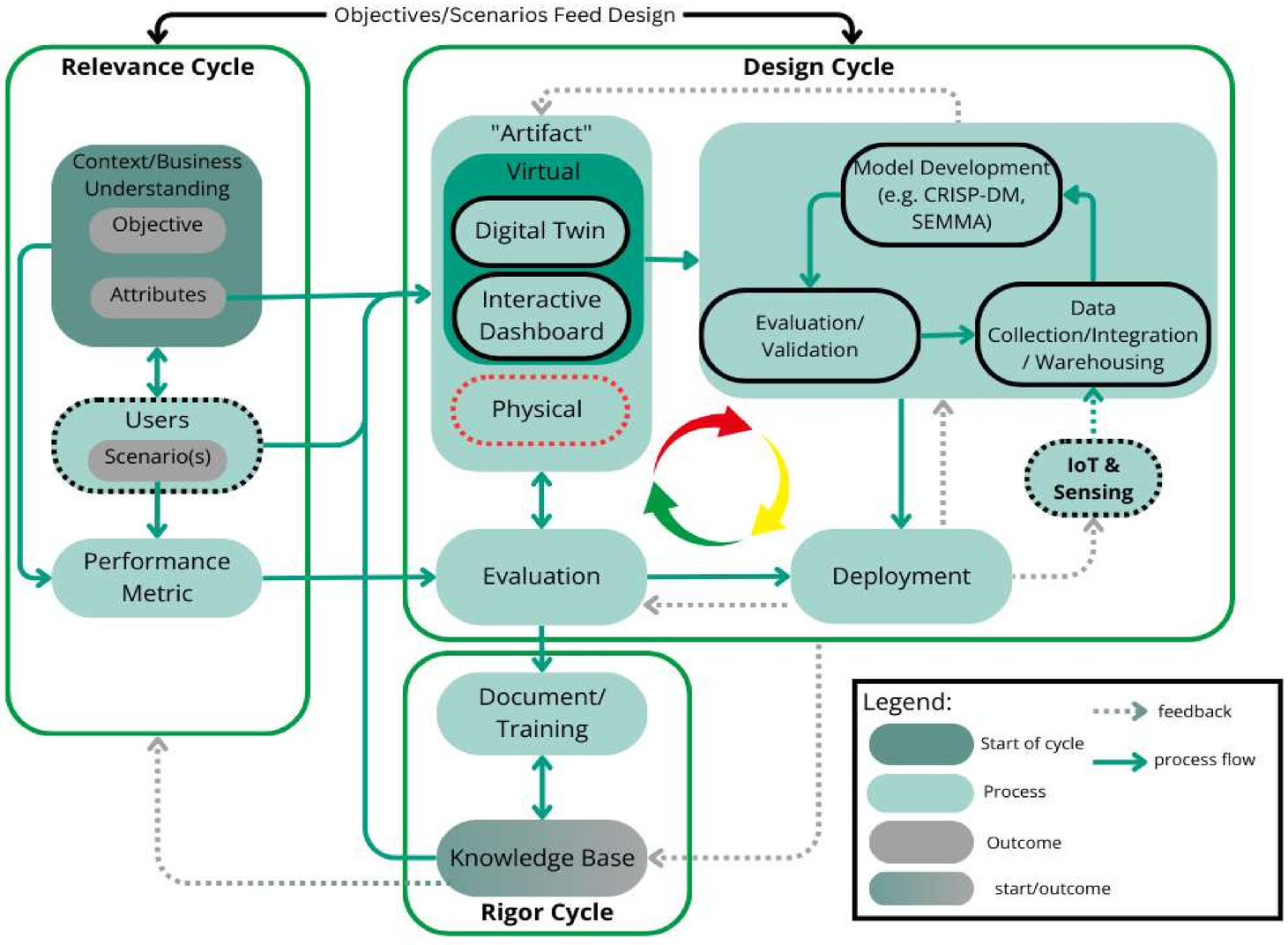
- Based on Design Science Research.
- Combines:
  - Relevance (goals, users, value)
  - Design (build/test artifacts)
  - Rigor (document knowledge)

Design Science Research Methodology

A research approach that focuses on **creating and improving practical solutions**. It involves understanding real-world problems, designing useful artifacts (like systems or frameworks), and evaluating them in context.



The Framework



In Brief

Step 1: Understand the business and users.
Step 2: Define goals, scenarios, success metrics.
Step 3: Design a physical/virtual demonstrator.
Step 4: Test, learn, adapt.
🌀 It's a cycle — not a one-shot process.

Real Case: Truck Factory

- Focus: carrier system in chassis line.
- Problem: unexpected stops.
- Data: vibration + hydraulic pressure.
- Result: dashboard that predicts faults early.
- Outcome: fewer breakdowns, better maintenance planning.

Conclusion and Future Work

- ❑ This framework helps connect real-world needs to working demonstrators.
- ❑ Next: apply it to other ZORRO partners' data for broader validation.

Zorro — Zero downtime in cyber physical systems
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